

I claim:

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102.2
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1. A method for cleaning a dirty surface, wherein water is squirted against the dirty surface in order to wash away the dirt with the water, wherein the water and compressed air are mixed, after which the water is squirted against the dirty surface in a spray of droplets, wherein use is made of a nozzle device having coaxial bores, the upstream wider portion of which serving as a mixing chamber wherein the water and the compressed air are mixed and wherein the mixture obtained has an overpressure relative to the environment, and the downstream narrower portion of which acting as a fluid port.
  2. A method according to claim 1, wherein the fluid port is a nozzle, wherein the spray of droplets is squirted against the dirty surface downstream of the nozzle.
  3. A method according to claim 1, wherein the fluid port leads to a second chamber having a nozzle, wherein the spray of droplets is squirted against the dirty surface downstream of the nozzle.
  4. A method according to claim 1, wherein the air pressure is at least 1 bar, preferably at least 1.5 bar.

5. A method according to claim 1, wherein the air pressure can be regulated, in particular steplessly so.

6. A method according to claim 1, wherein pressurized water is supplied to the mixing chamber at a predetermined pressure, downstream of the nozzle device.

7. A method according to claim 6, wherein the water pressure can be regulated, preferably steplessly so.

8. A method according to claim 7, wherein the water pressure can be regulated independently of the air pressure.

9. A method according to claim 1, wherein the air pressure and the water pressure are set to a ratio ranging between 2 : 1 and 1 : 2.

10. A method according to claim 1, wherein the water is squirted against the surface in a spray of droplets, from a distance which is smaller than the distance at which the water becomes turbulent downstream of the nozzle.

11. A method for cleaning according to claim 1 wherein the surface to be cleaned is on flower bulbs, flower tubers or perennial plants and wherein the water pressure and the air pressure are set as follows:

water pressure (bar)

air pressure (bar, as an overpressure relative to the water pressure)

from 0.5 to 1.5

from 8 to 8.5

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from 1.5 to 3

from 7.5 to 8

from 2.8 to 4.2

from 5.5 to 6

from 4 to 6.2

from 5 to 5.5

from 6 to 10

from 3.5 to 4 or from 4 to 4.5 or from 4.5 to 5 or from 5 to 5.5 or from 5.5 to 6 or from 6 to 6.5

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12. A method for cleaning according to claim 1 wherein the surface to be cleaned is on soft fruit, in particular strawberries, grapes, plums, red currants, blueberries or peaches, and wherein the water pressure and the air pressure are set as follows:

water pressure (bar)

air pressure (bar, as an overpressure relative to the water pressure)

0 to 0.5

1.5 to 2 or from 2 to 2.5

0.5 to 1.5

1.5 to 2 or from 2 to 2.5

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13. A method for cleaning according to claim 1 wherein the surface to be cleaned is on medium hard crops, in particular leek, asparagus, beans, stone leeks, paprikas, gherkins, cucumbers, cabbage varieties (cauliflower, white cabbage, green cabbage, red cabbage, etc.) or tomatoes, and wherein the water pressure and the air pressure are set as follows:

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water pressure (bar)

from 2.8 to 4.2

from 4 to 6.2

from 6 to 10

air pressure (bar, as an overpressure relative to the water pressure)

from 6.5 to 7 or from 7 to 7.5 or from 7.5 to 8 or from 8 to 8.5 or from 8.5 to 9 or from 9 to 9.5

from 6.5 to 7 or from 7 to 7.5 or from 7.5 to 8 or from 8 to 8.5 or from 8.5 to 9 or from 9 to 9.5

from 6.5 to 7 or from 7 to 7.5 or from 7.5 to 8 or from 8 to 8.5 or from 8.5 to 9 or from 9 to 9.5

14. A method for cleaning according to claim 1 wherein the surface to be cleaned is on hard crops, in particular carrots, scorzoneras and rootstocks and/or fruit trees, stem crops and/or root crops for multiplication purposes, products stemming from the cultivation of onions and/or silver-skin onions or carrots and wherein the water pressure and the air pressure are set as follows:

water pressure (bar)

from 2.8 to 4.2

from 4 to 6.2

air pressure (bar, as an overpressure relative to the water pressure)

from 9.5 to 10 or from 10 to 15 or from 15 to 20

from 9.5 to 10 or from 10 to 15 or from 15 to 20

from 6 to 10

from 9.5 to 10 or from 10  
to 15 or from 15 to 20

- 5 15. A method for cleaning according to claim 1 wherein  
the surface to be cleaned is on sugar beets,  
beetroots or potatoes, or the products stemming  
therefrom, in particular chips, pulp and cattle  
fodder products and wherein the water pressure and  
the air pressure are set as follows:

water pressure (bar)

air pressure (bar, as an  
overpressure relative to  
the water pressure)

from 6 to 10

from 4 to 4.5 or from 4.5  
to 5 or from 5 to 5.5 or  
from 5.5 to 6 or from 6 to  
6.5 or from 6.5 to 7 or  
from 7 to 7.5 or from 7.5  
to 8 or from 8 to 8.5 or  
from 8.5 to 9 or from 9 to  
9.5 or from 9.5 to 10 or  
from 10 to 15 or from 15 to  
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- 25 16. A method for cleaning according to claim 1 wherein  
the surface to be cleaned is on roads, in  
particular porous asphalt, and wherein the water  
pressure and the air pressure are set as follows:

water pressure (bar)

air pressure (bar, as an  
overpressure relative to  
the water pressure)

from 6 to 10

from 7 to 7.5 or from 7.5  
to 8 or from 8 to 8.5 or  
from 8.5 to 9 or from 9 to  
9.5 or from 9.5 to 10 or  
from 10 to 15 or from 15 to  
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17. A method for cleaning according to claim 1 wherein  
the surface to be cleaned is on vehicles, in  
particular passenger cars in a car wash, trains,  
buses or lorries in special washing facilities,  
and wherein the water pressure and the air  
pressure are set as follows :

water pressure (bar)

air pressure (bar, as an  
overpressure relative to  
the water pressure)

from 0.5 to 1.5

from 2.5 to 3 or from 3 to  
3.5 or from 3.5 to 4 or  
from 4 to 4.5 or from 4.5  
to 5 or from 5 to 5.5 or  
from 5.5 to 6.

18. A method for cleaning according to claim 1 wherein  
the surface to be cleaned is on crockery, cutlery  
and the like in a dishwasher, and machines or  
tools in an industrial washing-up machine, and  
wherein the water pressure and the air pressure  
are set as follows:

water pressure (bar)

from 0.5 to 1.5

air pressure (bar, as an overpressure relative to the water pressure)

from 4.5 to 5 or from 5 to 5.5 or from 5.5 to 6 or from 6 to 6.5 or from 6.5 to 7 or from 7 to 7.5 or from 7.5 to 8.

19. A method for cleaning according to claim 1 wherein the surface to be cleaned is on persons, using a shower head, and wherein the water pressure and the air pressure are set as follows:

water pressure (bar)

from 0.5 to 1.5

from 1.5 to 3

air pressure (bar, as an overpressure relative to the water pressure)

from 1.5 to 2 or from 2 to 2.5 or from 2.5 to 3 or from 3 to 3.5 or from 3.5 to 4 or from 4 to 4.5 or from 4.5 to 5

from 1.5 to 2 or from 2 to 2.5 or from 2.5 to 3 or from 3 to 3.5 or from 3.5 to 4 or from 4 to 4.5 or from 4.5 to 5.

20. A method for cleaning according to claim 1 wherein the surface to be cleaned is on hard surfaces, in particular facades of houses, industrial and commercial buildings, glass, plastics and metal

and wherein the water pressure and the air pressure are set as follows:

water pressure (bar)	air pressure (bar, as an overpressure relative to the water pressure)
from 6 to 10	from 9.5 to 10 or from 10 to 15 or from 15 to 20.

21. A method for cleaning according to claim 1 wherein the surface to be cleaned is on soft surfaces, in particular wool or fibrous materials, such as cotton, flax, textile, silk or paper and wherein the water pressure and the air pressure are set as follows:

water pressure (bar)	air pressure (bar, as an overpressure relative to the water pressure)
from 2.8 to 4.2	from 6.5 to 7 or from 7 to 7.5 or from 7.5 to 8 or from 8 to 8.5 or from 8.5 to 9 or from 9 to 9.5
from 4 to 6.2	from 6.5 to 7 or from 7 to 7.5 or from 7.5 to 8 or from 8 to 8.5 or from 8.5 to 9 or from 9 to 9.5
from 6 to 10	from 6.5 to 7 or from 7 to 7.5 or from 7.5 to 8 or from 8 to 8.5 or from 8.5 to 9 or from 9 to 9.5



22. A device for cleaning a dirty surface comprising  
a nozzle device having coaxial bores, the  
upstream wider portion of which serving as a  
mixing chamber and the downstream narrower  
5 portion of which acting as fluid port being a  
nozzle or leading to a second chamber having a  
nozzle and

means for supplying waters, which may or  
may not be pressurized, and compressed air at  
10 a predetermined pressure to the mixing  
chamber.

23. A device according to claim 22, wherein the nozzle  
is present in a wall of the mixing chamber.

24. A device according to claim 22, wherein the mixing  
15 chamber preferably converges in the direction of  
the nozzle.

25. A device according to claim 22, wherein means are  
provided for regulating the air pressure,  
preferably steplessly so, as well as means for  
20 regulating the water pressure, preferably  
steplessly so, in particular of the air pressure.

26. A device according to claim 22, wherein the nozzle  
is movable, and wherein the nozzle is preferably  
mounted on a rotatable arm.

27. A device according to claim 22, wherein the second  
chamber comprises a member which is capable of  
rotation under the influence of the water for

rotatably squirting the water in a spray of droplets downstream of the nozzle.

28. A device according to claim 22, wherein the device is accommodated in a housing.

5 29. A device for cleaning according to claim 22 wherein the surface to be cleaned is on flower bulbs, flower tubers or perennial plants and wherein the water pressure and air pressure are set as follows:

10	water pressure (bar)	air pressure (bar, as an overpressure relative to the water pressure)
	from 0.5 to 1.5	from 8 to 8.5
	from 1.5 to 3	from 7.5 to 8
15	from 2.8 to 4.2	from 5.5 to 6
	from 4 to 6.2	from 5 to 5.5
	from 6 to 10	from 3.5 to 4 or from 4 to 4.5 or from 4.5 to 5 or from 5 to 5.5 or from 5.5 to 6 or from 6 to 6.5
20		

30. A device for cleaning according to claim 22 wherein the surface to be cleaned is on soft fruit, in particular strawberries, grapes, plums, red currants, blueberries or peaches, and wherein  
25 the water pressure and air pressure are set as follows:

water pressure (bar)

air pressure (bar, as an  
overpressure relative to  
the water pressure)

0 to 0.5

1.5 to 2 or from 2 to 2.5

5

0.5 to 1.5

1.5 to 2 or from 2 to 2.5

31. A device for cleaning according to claim 22  
wherein the surface to be cleaned is on medium  
hard crops, in particular leek, asparagus, beans,  
stone leeks, paprikas, gherkins, cucumbers,  
cabbage varieties (cauliflower, white cabbage,  
green cabbage, red cabbage, etc.) or tomatoes, and  
wherein the water pressure and air pressure are  
set as follows:

water pressure (bar)

air pressure (bar, as an  
overpressure relative to  
the water pressure)

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from 2.8 to 4.2

from 6.5 to 7 or from 7 to  
7.5 or from 7.5 to 8 or  
from 8 to 8.5 or from 8.5  
to 9 or from 9 to 9.5

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from 4 to 6.2

from 6.5 to 7 or from 7 to  
7.5 or from 7.5 to 8 or  
from 8 to 8.5 or from 8.5  
to 9 or from 9 to 9.5

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from 6 to 10

from 6.5 to 7 or from 7 to  
7.5 or from 7.5 to 8 or  
from 8 to 8.5 or from 8.5  
to 9 or from 9 to 9.5

32. A device for cleaning according to claim 22  
wherein the surface to be cleaned is on hard

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crops, in particular carrots, scorzoneras and  
rootstocks and/or fruit trees, stem crops and/or  
root crops for multiplication purposes, products  
stemming from the cultivation of onions and/or  
silver-skin onions or carrots, and wherein the  
water pressure and air pressure are set as  
follows:

water pressure (bar)	air pressure (bar, as an overpressure relative to the water pressure)
from 2.8 to 4.2	from 9.5 to 10 or from 10 to 15 or from 15 to 20
from 4 to 6.2	from 9.5 to 10 or from 10 to 15 or from 15 to 20
from 6 to 10	from 9.5 to 10 or from 10 to 15 or from 15 to 20

33. A device for cleaning according to claim 22  
wherein the surface to be cleaned is on sugar  
beets, beetroots or potatoes, or the products  
stemming therefrom, in particular chips, pulp and  
cattle fodder products, and wherein the water  
pressure and air pressure are set as follows:

water pressure (bar)	air pressure (bar, as an overpressure relative to the water pressure)
from 6 to 10	from 4 to 4.5 or from 4.5 to 5 or from 5 to 5.5 or from 5.5 to 6 or from 6 to

6.5 or from 6.5 to 7 or  
from 7 to 7.5 or from 7.5  
to 8 or from 8 to 8.5 or  
from 8.5 to 9 or from 9 to  
9.5 or from 9.5 to 10 or  
from 10 to 15 or from 15 to  
20

34. A device for cleaning according to claim 22  
wherein the surface to be cleaned is on roads, in  
particular porous asphalt, and wherein the water  
pressure and air pressure are set as follows:

water pressure (bar)	air pressure (bar, as an overpressure relative to the water pressure)
from 6 to 10	from 7 to 7.5 or from 7.5 to 8 or from 8 to 8.5 or from 8.5 to 9 or from 9 to 9.5 or from 9.5 to 10 or from 10 to 15 or from 15 to 20

35. A device for cleaning according to claim 22  
wherein the surface to be cleaned is on vehicles,  
in particular passenger cars in a car wash,  
trains, buses or lorries in special washing  
facilities, and wherein the water pressure and air  
pressure are set as follows:

water pressure (bar)	air pressure (bar, as an overpressure relative to the water pressure)
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from 0.5 to 1.5

from 2.5 to 3 or from 3 to  
3.5 or from 3.5 to 4 or  
from 4 to 4.5 or from 4.5  
to 5 or from 5 to 5.5 or  
from 5.5 to 6.

5

36. A device for cleaning according to claim 22  
wherein the surface to be cleaned is on crockery,  
cutlery and the like in a dishwasher, and machines  
or tools in an industrial washing-up machine, and  
wherein the water pressure and air pressure are  
set as follows:

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water pressure (bar)

air pressure (bar, as an  
overpressure relative to  
the water pressure)

15

from 0.5 to 1.5

from 4.5 to 5 or from 5 to  
5.5 or from 5.5 to 6 or  
from 6 to 6.5 or from 6.5  
to 7 or from 7 to 7.5 or  
from 7.5 to 8.

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37. A device for cleaning according to claim 22  
wherein the surface to be cleaned is on persons,  
using a shower head, and wherein the water  
pressure and air pressure are set as follows:

water pressure (bar)

air pressure (bar, as an  
overpressure relative to  
the water pressure)

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from 0.5 to 1.5

from 1.5 to 2 or from 2 to  
2.5 or from 2.5 to 3 or  
from 3 to 3.5 or from 3.5  
to 4 or from 4 to 4.5 or  
from 4.5 to 5

from 1.5 to 3

from 1.5 to 2 or from 2 to  
2.5 or from 2.5 to 3 or  
from 3 to 3.5 or from 3.5  
to 4 or from 4 to 4.5 or  
from 4.5 to 5.

38. A device for cleaning according to claim 22  
wherein the surface to be cleaned is on hard  
surfaces, in particular facades of houses,  
industrial and commercial buildings, glass,  
plastics and metal, and wherein the water pressure  
and air pressure are set as follows:

water pressure (bar)

air pressure (bar, as an  
overpressure relative to  
the water pressure)

from 6 to 10

from 9.5 to 10 or from 10  
to 15 or from 15 to 20.

39. A device for cleaning according to claim 22  
wherein the surface to be cleaned is on soft  
surfaces, in particular wool or fibrous materials,  
such as cotton, flax, textile, silk or paper, and  
wherein the water pressure and air pressure are  
set as follows:

water pressure (bar)

from 2.8 to 4.2

from 4 to 6.2

from 6 to 10

air pressure (bar, as an  
overpressure relative to  
the water pressure)

from 6.5 to 7 or from 7 to  
7.5 or from 7.5 to 8 or  
from 8 to 8.5 or from 8.5  
to 9 or from 9 to 9.5

from 6.5 to 7 or from 7 to  
7.5 or from 7.5 to 8 or  
from 8 to 8.5 or from 8.5  
to 9 or from 9 to 9.5

from 6.5 to 7 or from 7 to  
7.5 or from 7.5 to 8 or  
from 8 to 8.5 or from 8.5  
to 9 or from 9 to 9.5

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